Docket No. BIO0122USNP

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Assaf Govari	Confirmation No.:	5451
Appln. No.	:	10/029,473		
Filed	:	December 21, 2001		
Title	:	WIRELESS POSITION SENSOR		
Art Unit	:	3737		
Examiner	:	E.M. Mantis Mercader		

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

June 23, 2006
(Date of Deposit)

Louis J. Capezzuto
(Name of applicant, assignee, or Registered Representative)

/Louis J. Capezzuto/
(Signature)

June 23, 2006
(Date of Signature)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

i. Real Party in Interest

Biosense Webster, Inc., a California Corporation, is the real party in interest.

ii. Related Appeals and Interferences

None.

iii. Status of Claims

Claims 1 - 49 are pending in the case. Claims 1 – 49 have been finally rejected on February 24, 2006 and this Appeal is taken from these claims.

iv. Status of Amendments

No Amendments have been filed subsequent to the Final Rejection mailed on February 24, 2006.

v. Summary of Claimed Subject Matter

As fully supported in Applicant's Specification, the claimed present invention of independent claim 1 is directed to an apparatus 20 for tracking an object (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (such as a patient) as depicted in Fig.1 and described in Specification Page 21, lines 1 –17. Apparatus 20 comprises a plurality of field generators 28, adapted to generate electromagnetic fields at different, respective frequencies in a vicinity of the object 30 and a radio frequency (RF) driver 50 (depicted in Fig. 3), adapted to radiate a RF driving field toward the object 30. Specification Page 21, line – Page 22, line 1 and Specification Page 22, lines 6 - 9.

Apparatus 20 also comprises a wireless transponder 40, fixed to the object 30, as shown in Fig. 2, wherein the transponder 40 comprises at least one sensor coil 46, coupled so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields (generated by the field generators 28); a control circuit 44 (control chip), coupled to the at least one sensor coil 46 so as to generate an output signal indicative of the current; and a power coil 42, coupled to receive the RF driving field

(from RF driver 50) and to convey electrical energy from the driving field to the control circuit 44, and further coupled to transmit the output signal generated by the control circuit 44. Specification Page 22, line 28 – Page 23, line 19.

Apparatus 20 also comprises a signal receiver 56, adapted to receive the output signal transmitted by the power coil 42 and, responsive thereto, to determine coordinates of the object 30 in the body 24 of the subject 26 and signal processing circuits operatively connected to the signal receiver 56 for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates. Specification Page 25, lines 1 – 9; and Fig. 3.

Independent Claim 11 of Applicant's present invention is directed to an apparatus 20 for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient) comprising a radio frequency (RF) driver 50 (Fig. 2), adapted to radiate a RF driving field toward the object 30 at a driving frequency; and one or more field generators 28, adapted to generate electromagnetic fields in a vicinity of the object 30 at respective field frequencies, in synchronization with the driving frequency. Specification Page 23, lines 14 – 21; Specification Page 25, line 30 – Page 26, line 2; Figs. 1 and 2.

Apparatus 20 of Claim 11 also comprises a wireless transponder 40, fixed to the object 30 as shown in Fig. 2. The transponder 40 comprises at least one sensor coil 46, coupled so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields (generated by the field generators 28); a control circuit 44, coupled to the at least one sensor coil 46 so as to generate an output signal indicative of

the current; and a power coil 42, coupled to receive the RF driving field (from the RF driver 50) and to convey electrical energy from the driving field to the control circuit 44, and further coupled to transmit the output signal generated by the control circuit 44. Specification Page 22, line 28 – Page 23, line 19.

Apparatus 20 of Claim 11 also comprises a signal receiver 56, adapted to receive the output signal transmitted by the power coil 42 and, responsive thereto, to determine coordinates of the object 30 in the body 24 of the subject 26 and signal processing circuits operatively connected to the signal receiver 56 for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates. Specification Page 25, lines 1 – 9; and Fig. 3.

Independent Claim 17 of Applicant's present invention is directed to an apparatus 20 for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient)comprising a radio frequency (RF) driver 50 (Fig. 2), adapted to radiate a RF driving field toward the object 30 and one or more field generators 28, adapted to generate electromagnetic fields in a vicinity of the object 30. Specification Page 23, lines 14 – 21 and Figs. 1 and 2.

Apparatus 20 of Claim 17 also comprises a wireless transponder 40, fixed to the object 30, wherein the transponder 40 comprises at least one sensor coil 46, coupled so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields; a control circuit 44, coupled to the at least one sensor coil 46 so as to generate an output signal indicative of an amplitude of the current and of a phase of the

current relative to a phase of the electromagnetic fields; and a power coil 42, coupled to receive the RF driving field (from RF power driver 50 as shown in Fig. 3) and to convey electrical energy from the driving field to the control circuit 44, and further coupled to transmit the output signal generated by the control circuit 44. Specification Page 22, line 28 – Page 23, line 19.

Apparatus 20 of Claim 17 also comprises a signal receiver 56, adapted to receive the output signal transmitted by the power coil 42 and, responsive to the amplitude and phase of the current indicated by the output signal, to determine an orientation of the object 30 in the body 24 of the subject 26 and signal processing circuits operatively connected to the signal receiver 56 for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates. Specification Page 23, lines 19 – 29 and Page 25, lines 1 – 9; and Fig. 3.

Independent Claim 21 of Applicant's present invention is directed to an apparatus 20 for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient) comprising a radio frequency (RF) driver 50, adapted to radiate a RF driving field toward the object 30 and one or more field generators 28, adapted to generate electromagnetic fields in a vicinity of the object 30. Specification Page 23, lines 14 – 21 Figs. 1 and 2.

Apparatus of Claim 21 further comprises a wireless transponder 40, fixed to the object 30, wherein the transponder 40 comprises at least one sensor coil 46, coupled so that an electrical current flows in the at least one sensor coil 46 responsive to the

electromagnetic fields; a voltage-to-frequency (V/F) converter 44, coupled to the at least one sensor coil 46 so as to generate an output signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil 46; and a power coil 42 , coupled to receive the RF driving field (from RF power driver 50) and to convey electrical energy from the driving field to the control circuit 44, and further coupled to transmit the output signal generated by the control circuit 44. Specification Page 22, line 28 – Page 23, line 19.

Apparatus of Claim 21 also comprises a signal receiver 56, adapted to receive the output signal transmitted by the power coil 42 and, responsive to the output frequency, to determine coordinates of the object 30 in the body 24 of the subject 26 and signal processing circuits operatively connected to the signal receiver 56 for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates. Specification Page 23, lines 19 – 29 and Page 25, lines 1 – 9; and Fig. 3.

Independent Claim 23 of Applicant's present invention, as best shown in Figs. 1 and 2, is directed to a wireless position transponder 40 for operation inside a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (as a patient) wherein the transponder 40 comprises at least one sensor coil 46, coupled so that an electrical current flows in the at least one sensor coil 46 responsive to one or more electromagnetic fields applied to the body 24 in a vicinity of the transponder 40; a control circuit comprising a voltage-to-frequency (V/F) converter 44, coupled to the at least one sensor coil 46 so as to generate an output signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil 46, such that the output frequency is indicative of coordinates of the transponder 40 inside the body 24; and a power coil 42, adapted to receive a radio frequency (RF) driving field (from RF power driver 50 as shown in Fig. 3) applied to the body 24 in the vicinity of the transponder 40, and coupled to convey electrical energy from the driving field to the

control circuit 40, and further coupled to transmit the output signal generated by the control circuit 40 so that the signal can be received by processing circuitry 58 (computer) outside the body 24 for use in determining the coordinates depicted in Fig. 3. Specification Page 22, line 28 – Page 23, line 19.

Independent Claim 27 of Applicant's present invention is directed to a method for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient), comprising the steps of positioning a plurality of field generators 28 so as to generate electromagnetic fields at different, respective frequencies in a vicinity of the object 30 and positioning a radio frequency (RF) driver 50 to radiate a RF driving field toward the object 30. Specification Page 21, line 25 – Page 22, line 2; Specification Page 23, lines 15 – 29; and Fig 3.

The method of independent Claim 27 further comprises the steps of fixing to the object 30 a wireless transponder 40 comprising at least one sensor coil 46 and a power coil 42, so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields; receiving the RF driving field using the power coil 42 so as to derive electrical energy therefrom; generating an output signal at the wireless transponder 40 indicative of the current flowing in the sensor coil 46, using the electrical energy derived from the RF driving field by the power coil 42; transmitting the output signal from the wireless transponder 40 using the power coil 42; and receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object 30 in the body 24 of the subject 26. Specification Page 21, line 25 – Page 22, line 17; Specification Page 23, lines 14 – 29; and Figs 1 – 3.

Independent Claim 38 of Applicant's present invention is directed a method for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient), comprising the steps of positioning a radio frequency (RF) driver 50 to radiate a RF driving field toward the object 30 at a driving frequency; and positioning one or more field generators 28 so as to generate electromagnetic fields in a vicinity of the object 30 at respective field frequencies, in synchronization with the driving frequency. Specification Page 23, lines 14 – 21; Specification Page 25, line 30 – Page 26, line 2; Figs. 1 and 2.

The method of Claim 38 further comprises fixing to the object 30 a wireless transponder 40 comprising at least one sensor coil 46 and a power coil 42, so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields; receiving the RF driving field (from the RF power driver 50) using the power coil 42 so as to derive electrical energy therefrom; generating an output signal at the wireless transponder 40 indicative of the current flowing in the sensor coil 46, using the electrical energy derived from the RF driving field by the power coil 42; transmitting the output signal from the wireless transponder 40 using the power coil 42; and receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object 30 in the body 24 of the subject 26. Specification Page 21, line 25 – Page 22, line 17; Specification Page 23, lines 14 – 29; and Figs 1 – 3.

Independent Claim 44 of Applicant's present invention is directed a method for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification;

see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient), comprising the steps of positioning a radio frequency (RF) driver 50 to radiate a RF driving field toward the object 30 and positioning one or more field generators 28 so as to generate electromagnetic fields in a vicinity of the object 30. Specification Page 21, line 25 – Page 22, line 2; Specification Page 23, lines 15 – 29; and Fig 3.

The method of Claim 44 further comprises fixing to the object 30 a wireless transponder 40 comprising at least one sensor coil 46 and a power coil 42, so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields; receiving the RF driving field using the power coil 42 so as to derive electrical energy therefrom; generating an output signal at the wireless transponder 40 indicative of an amplitude of the current flowing in the at least one sensor coil 46 and of a phase of the current relative to a phase of the electromagnetic fields, using the electrical energy derived from the RF driving field by the power coil 42; transmitting the output signal from the wireless transponder 40 using the power coil 42; and receiving the output signal, and processing the amplitude and phase of the current indicated by the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object 30 in the body 24 of the subject 26. Specification Page 21, line 25 – Page 22, line 17; Specification Page 22, line 28 – Page 23, line 19; Specification Page 23, lines 14 – 29; and Figs 1 – 3.

Independent Claim 48 of Applicant's present invention is directed to a method for tracking an object 30 (a probe such as a catheter 30 or other type of invasive tool or implantable device such as orthopedic implants as described in Applicant's Specification; see for example, Page 21, lines 14 – 24 and Page 29, lines 23 – 28 respectively) in a body 24 (for example, the heart 24 or at an orthopedic area within a patient's body such as a hip joint as shown in Figs. 1 and 4 respectively) of a subject 26 (patient), comprising the

steps of positioning a radio frequency (RF) driver 50 to radiate a RF driving field toward the object 30 and positioning one or more field generators 28 so as to generate electromagnetic fields in a vicinity of the object 30 as shown in Fig. 3. Specification Page 21, line 25 – Page 22, line 2; Specification Page 23, lines 15 – 29; and Fig 3.

The method of Claim 48 further comprises the steps of fixing to the object 30 a wireless transponder 40 comprising at least one sensor coil 46 and a power coil 42, so that an electrical current flows in the at least one sensor coil 46 responsive to the electromagnetic fields (generated by the field generators 28 as shown in Fig. 1); receiving the RF driving field (from the RF power driver 50 as shown in Fig. 3) using the power coil 42 so as to derive electrical energy therefrom; generating an output signal at the wireless transponder 40 having an output frequency that varies responsive to an amplitude of the current flowing in the at least one sensor coil 46, using the electrical energy derived from the RF driving field by the power coil 42; transmitting the output signal from the wireless transponder 40 using the power coil 42; and receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object 30 in the body 24 of the subject 26 responsive to the output frequency. Specification Page 21, line 25 – Page 22, line 17; Specification Page 23, lines 14 – 29; and Figs 1 – 3.

vi. Grounds of Rejection to be Reviewed on Appeal

1. Claims 1 – 49 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,447,448 (Ishikawa et al.) in view of U.S. Patent Application Publication No. 2003/0167000 (Mullick et al.).

vii. Argument

1. The rejection of Claims 1 – 49 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,447,448 (Ishikawa et al.) in view of U.S. Patent Application Publication No. 2003/0167000 (Mullick et al.) is improper and without basis and should be overruled.

A claimed invention is unpatentable if the differences between it and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a) (Supp. 1998); *see Graham v. John Deere Co.*, 383 U.S. 1, 14, 148 USPQ 459, 465 (1966). The ultimate determination of whether an invention is or is not obvious is a legal conclusion based on underlying factual inquiries including: (1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *See Graham*, 383 U.S. at 17-18, 148 USPQ at 467; *Miles Labs, Inc., Inc. v. Shandon Inc.*, 997 F.2d 870, 877, 27 USPQ2d 1123, 1128 (Fed. Cir. 1993).

Turning now to the cited prior art references, Ishikawa et al. is directed to implanted orthopedic sensors that are substantially spherical semiconductor balls implanted in orthopedic structures for functions such as sensing and/or stimulation. Remote energizing and interrogation is briefly mentioned on Col. 6, lines 30 –44. However, it is important to note that there are no teachings, suggestions or even inferences in Ishikawa et al. directed toward an apparatus and method for tracking an object in the body using a combination of novel features such as a wireless transponder having at least one sensor coil, a control circuit coupled to the at least one sensor coil and a power coil in conjunction with a plurality of field generators adapted to generate electromagnetic fields at different respective frequencies and a signal receiver adapted to receive output signal transmitted by the power coil and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates

of the object in the body of the subject such as found with Applicant's claimed present invention.

Mullick et al. teaches a miniature ingestible capsule 12 with an illuminator 10 for providing light into the gastrointestinal tract, a lens and imaging array 16 arrangement, a transceiver 18 and a power source 22 to provide power to these components. Transceiver 18 sends signals to transceiver 20 located outside of the capsule. Par. No. [0053]. "Simultaneously, a pose detection system 26 tracks a beacon 28 located inside the capsule and relays tracking information to the recording and display system 24, which forms a display 30." Par. No. [0053]. Mullick et al. generally discloses the existence of methods used to determine six degree of freedom pose of a remote object. Par. No. [0061]. The reference fails to address any further specifics.

Thus, one can easily ascertain that there are significant differences between the teachings of these prior art references and the Applicant's claimed invention especially since none of these references teach or suggest a combination of novel features and method steps for tracking an object in the body using the novel combination of a wireless transponder having at least one sensor coil, a control circuit coupled to the at least one sensor coil and a power coil in conjunction with a plurality of field generators adapted to generate electromagnetic fields at different respective frequencies and a signal receiver adapted to receive output signal transmitted by the power coil and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body of the subject such as found with Applicant's claimed present invention.

Moreover, as set forth in *In re Gurley*, 27 F.3d 551; 31 USPQ 2d 1130 (Fed. Cir. 1994):

> A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path

> set out in the reference, or would be in a direction divergent from the path that was taken by Applicant.

As taught in Par No. [0061] of Mullick et al., the miniature ingestible capsule devices "use a RF or EM beacon that *reflects* signals from an externally fixed transmitter, *somewhat like a miniature radar system*." (emphasis added). Accordingly, the capsule of Mullick et al. does not use a sensor coil that outputs a signal (that is transmitted by the power coil) in conjunction with signal processing circuits operatively connected to a signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body such as found with Applicant's claimed present invention. Rather, Mullick et al. is limited to a beacon that operates using reflection techniques, i.e. in a radar-like manner. Thus, one of ordinary skill in the surgical navigation field would be entirely discouraged from following the path set out in the teachings Mullick et al. as well as Ishikawa et al. And, it is clear that both of these references actually teach away from Applicant's claimed present invention.

In establishing a basis for denying patentability of an invention, the initial burden rests with the Examiner. *In re Piasecki*, 745 F.2d 1468; 223 USPQ 785 (Fed. Cir. 1984). Thus, it is incumbent upon the Examiner to provide a reason why of ordinary skill in the art would have been led to modify a prior art reference or to combine teachings in order to arrive at the claimed invention. *Ex Parte Clapp,* 227 USPQ 972 (BPAI 1985). Moreover, this reason must stem from some teaching, suggestion or inference in the prior art or knowledge generally available and not from the Applicant's disclosure. *Uniroyal, Inc., v. Rudkin-Wiley Corp.*, 837 F.2d 1044; 5 USPQ 2d 1434 (Fed. Cir. 1988). As stated in *W.L. Gore and Associates, Inc., v. Garlock, Inc.*, 721 F.2d 1540; 220 USPQ 303 (Fed. Cir. 1983):

> [t]o imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

The Federal Circuit's case law makes clear that the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references. *See, e.g., C.R. Bard, Inc. v. M3 Sys., Inc.*, 157 F.3d 1340, 1352, 48 USPQ2d 1225, 1232 (Fed. Cir. 1998) (describing "teaching or suggestion or motivation [to combine]" as an "essential evidentiary component of an obviousness holding"); *In re Rouffet*, 149 F.3d 1350, 1359, 47 USPQ2d 1453, 1459 (Fed. Cir. 1998) ("the Board must identify specifically . . . the reasons one of ordinary skill in the art would have been motivated to select the references and combine them"); *In re Fritch*, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (Examiner can satisfy burden of obviousness in light of combination "only by showing some objective teaching [leading to the combination]"); *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) (evidence of teaching or suggestion "essential" to avoid hindsight); *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 297, 227 USPQ 657, 667 (Fed. Cir. 1985) (district court's conclusion of obviousness was error when it "did not elucidate any factual teachings, suggestions or incentives from this prior art that showed the propriety of combination"). *See also Graham*, 383 U.S. at 18, 148 USPQ at 467 ("strict observance" of factual predicates to obviousness conclusion required). Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability--the essence of hindsight. *See, e.g., Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985) ("The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time."). In this case, it appears that the Examiner has fallen into the hindsight trap.'

Not only do both the Ishikawa et al. and Mullick et al. references set forth teachings that are completely divergent from the Applicant's claimed invention (as addressed previously above), but, there is clearly no motivation to combine the miniature ingestible capsule containing radar-like beacon technology of Mullick et al. with the semiconductor ball implant of Ishikawa et al. Both of these references simply do not

address in any manner the combination of novel features and method steps for tracking an object in the body using the novel combination of a wireless transponder having at least one sensor coil, a control circuit coupled to the at least one sensor coil and a power coil in conjunction with a plurality of field generators adapted to generate electromagnetic fields at different respective frequencies and a signal receiver adapted to receive output signal transmitted by the power coil and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body of the subject such as found with the Applicant's claimed present invention.

Accordingly, since neither Ishikawa et al. nor Mullick et al. fail to show any teaching or motivation to combine in the manner suggested by the Examiner, especially in a manner that could ever arrive at the Applicant's claimed present invention, there is no doubt that Applicant's own disclosure is being improperly used as a blue print and is a classic example of hindsight.

Furthermore, as is well established, prior art patents can only be used for what they clearly disclose or suggest. *In re Randol and Redford*, 425 F. 2d 1268, 165 USPQ 586, 588 (C.C.P.A. 1970). And, as set forth in *In re Randol and Redford*, it is clearly improper to use a patent as a reference for modifying its structure in a manner in which the prior art references do not suggest. Thus, just because Mullick et al. generally discloses the existence of methods used to determine six degree of freedom pose of a remote object, it does not mean that unreasonable license should be taken with the teachings of this reference as proposed by the Examiner, i.e. an unreasonable attempt to modify this teaching with the teachings of Ishikawa et al. in an effort to arrive at the Applicant's claimed present invention, especially when there is absolutely no indication in the limited teachings of Mullick et al. (and the Ishikawa et al. reference for that matter) that such a modification (as suggested by the Examiner) could ever be feasible or even desirable.

Therefore, based on the reasons outlined above, it is clear that this obviousness rejection is without merit and should be overruled.

Respectfully submitted,

By: /Louis J. Capezzuto/
Louis J. Capezzuto
Reg. No. 37,107

Johnson & Johnson
One Johnson & Johnson Plaza
New Brunswick, NJ 08933-7003
(732) 524-2218
Dated: June 23, 2006

viii. Claims Appendix

Claim 1.

Apparatus for tracking an object in a body of a subject, comprising:

a plurality of field generators, adapted to generate electromagnetic fields at different, respective frequencies in a vicinity of the object;

a radio frequency (RF) driver, adapted to radiate a RF driving field toward the object;

a wireless transponder, adapted to be fixed to the object, the transponder comprising:

at least one sensor coil, coupled so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;

a control circuit, coupled to the at least one sensor coil so as to generate an output signal indicative of the current; and

a power coil, coupled to receive the RF driving field and to convey electrical energy from the driving field to the control circuit, and further coupled to transmit the output signal generated by the control circuit; and

a signal receiver, adapted to receive the output signal transmitted by the power coil and, responsive thereto, and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body of the subject.

Claim 2. Apparatus according to claim 1, wherein the electrical current in the at least one sensor coil has frequency components at the different frequencies of the one or more field generators, and wherein the signal generated by the control circuit is indicative of the frequency components of the current.

Claim 3. Apparatus according to claim 1, wherein the one or more field generators are adapted to generate the electromagnetic fields at respective field frequencies, and the RF driver is adapted to radiate the RF driving field at a driving frequency, and wherein the one or more field generators and the RF driver are coupled to operate so that the field frequencies and driving frequency are mutually synchronized.

Claim 4. Apparatus according to claim 1, wherein the control circuit is adapted to generate the output signal so as to indicate a phase of the current flowing in the at least one sensor coil, relative to a phase of the electromagnetic fields.

Claim 5. Apparatus according to claim 1, wherein the control circuit comprises a voltage-to-frequency (V/F) converter, which is coupled to generate the output signal with an output frequency that varies responsive to the electrical current flowing in the at least one sensor coil.

Claim 6. Apparatus according to claim 1, wherein the transponder is adapted to be inserted, together with the object, into a body of a subject, while the one or more field generators and the RF driver are placed

outside the body.

Claim 7. Apparatus according to claim 6, wherein the object comprises an elongate probe, for insertion into the body, and wherein the transponder is fixed in the probe so as to enable the receiver to determine the coordinates of a distal end of the probe.

Claim 8. Apparatus according to claim 6, wherein the object comprises an implant, and wherein the transponder is fixed in the implant so as to enable the receiver to determine the coordinates of the implant within the body.

Claim 9. Apparatus according to claim 8, wherein the implant comprise a hip joint implant, comprising a femur head and an acetabulum, and wherein the transponder comprises a plurality of transponders fixed respectively to the femur head and the acetabulum, and wherein the signal receiver is adapted to determine a distance between the femur head and the acetabulum responsive to the output signal from the transponders.

Claim 10. Apparatus according to claim 1, wherein the control circuit is adapted to operate powered solely by the electrical energy conveyed thereto by the power coil.

Claim 11. Apparatus for tracking an object in a body of a subject, comprising:

a radio frequency (RF) driver, adapted to radiate a RF driving field toward the object at a driving frequency;

one or more field generators, adapted to generate electromagnetic fields in a vicinity of the object at respective field frequencies, in synchronization with the driving frequency;

a wireless transponder, adapted to be fixed to the object, the transponder comprising:

at least one sensor coil, coupled so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;

a control circuit, coupled to the at least one sensor coil so as to generate an output signal indicative of the current; and

a power coil, coupled to receive the RF driving field and to convey electrical energy from the driving field to the control circuit, and further coupled to transmit the output signal generated by the control circuit; and

a signal receiver, adapted to receive the output signal transmitted by the power coil and, responsive thereto, and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body of the subject.

Claim 12. Apparatus according to claim 11, wherein the control circuit is coupled to receive a frequency synchronization signal from the power coil, responsive to the RF driving field, and to apply the frequency synchronization signal in generating the

output signal.

Claim 13. Apparatus according to claim 11, wherein the driving frequency of the RF driving field is an integer multiple of the field frequencies of the electromagnetic fields of the one or more field generators.

Claim 14. Apparatus according to claim 11, wherein the control circuit is adapted to generate the output signal, responsive to the synchronization of the field frequencies with the driving frequency, so as to indicate a phase of the current flowing in the at least one sensor coil, relative to a phase of the electromagnetic fields.

Claim 15. Apparatus according to claim 11, wherein the control circuit comprises a voltage-to-frequency (V/F) converter, which is coupled to generate the output signal with an output frequency that varies responsive to the electrical current flowing in the at least one sensor coil.

Claim 16. Apparatus according to claim 11, wherein the transponder is adapted to be inserted, together with the object, into a body of a subject, while the one or more field generators and the RF driver are placed outside the body.

Claim 17. Apparatus for tracking an object in a body of a subject, comprising:

a radio frequency (RF) driver, adapted to radiate a RF driving field toward the object;

one or more field generators, adapted to generate electromagnetic fields in a vicinity of the object;

a wireless transponder, adapted to be fixed to the object, the transponder comprising:
at least one sensor coil, coupled so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;
a control circuit, coupled to the at least one sensor coil so as to generate an output signal indicative of an amplitude of the current and of a phase of the current relative to a phase of the electromagnetic fields; and
a power coil, coupled to receive the RF driving field and to convey electrical energy from the driving field to the control circuit, and further coupled to transmit the output signal generated by the control circuit; and
a signal receiver, adapted to receive the output signal transmitted by the power coil and, responsive to the amplitude and phase of the current indicated by the output signal, and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation an orientation of the object in the body of the subject.

Claim 18. Apparatus according to claim 17, wherein the at least one sensor coil comprises a single sensor coil, and wherein the signal receiver is adapted, responsive to the indicated phase of the current, to determine a direction of the orientation of the transponder.

Claim 19. Apparatus according to claim 17, wherein the control circuit comprises a voltage-to-frequency (V/F) converter, which is coupled to generate the output signal with an output frequency that varies responsive to the electrical current flowing in the at least one sensor coil.

Claim 20. Apparatus according to claim 17, wherein the transponder is adapted to be inserted, together with the object, into a body of a subject, while the one or more field generators and the RF driver are placed outside the body.

Claim 21. Apparatus for tracking an object in a body of a subject, comprising:

a radio frequency (RF) driver, adapted to radiate a RF driving field toward the object;

one or more field generators, adapted to generate electromagnetic fields in a vicinity of the object;

a wireless transponder, adapted to be fixed to the object, the transponder comprising:

at least one sensor coil, coupled so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;

a voltage-to-frequency (V/F) converter, coupled to the at least one sensor coil so as to generate an output signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil; and

a power coil, coupled to receive the RF driving field and to convey electrical energy from the driving field to the control circuit, and further coupled to

transmit the output signal generated by the control circuit; and
a signal receiver, adapted to receive the output signal transmitted by the power coil and, responsive to the output frequency, and signal processing circuits operatively connected to the signal receiver for determining three dimensions of position information and at least two dimensions of orientation information wherein the information is the position and orientation coordinates of the object in the body of the subject.

Claim 22.

Apparatus according to claim 21, wherein the transponder is adapted to be inserted, together with the object, into a body of a subject, while the one or more field generators and the RF driver are placed outside the body.

Claim 23.

A wireless position transponder for operation inside a body of a subject, the transponder comprising:
at least one sensor coil, coupled so that an electrical current flows in the at least one sensor coil responsive to one or more electromagnetic fields applied to the body in a vicinity of the transponder;
a control circuit comprising_a voltage-to-frequency (V/F) converter, coupled to the at least one sensor coil so as to generate an output signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil, such that the output frequency is indicative of coordinates of the transponder inside the body; and

a power coil, adapted to receive a radio frequency (RF) driving field applied to the body in the vicinity of the transponder, and coupled to convey electrical energy from the driving field to the control circuit, and further coupled to transmit the output signal generated by the control circuit so that the signal can be received by processing circuitry outside the body for use in determining three dimensions of position information and at least two dimensions of orientation information wherein the information is position and orientation body for use in determining the coordinates.

Claim 24. A transponder according to claim 23, wherein the sensor coil, V/F converter and power coil are together adapted to be fixed inside an elongate probe, for insertion into the body, so as to enable the processing circuitry to determine the coordinates of a distal end of the probe.

Claim 25. A transponder according to claim 23, wherein the sensor coil, V/F converter and power coil are together adapted to be fixed inside an implant, so as to enable the processing circuitry to determine the coordinates of the implant within the body.

Claim 26. A transponder according to claim 23, wherein the V/F converter is adapted to operate powered solely by the electrical energy conveyed thereto by the power coil.

Claim 27. A method for tracking an object in a body of a subject, comprising:

positioning a plurality of field generators so as to generate electromagnetic fields at different, respective frequencies in a vicinity of the object;
positioning a radio frequency (RF) driver to radiate a RF driving field toward the object;
adapting to be fixed to the object, a wireless transponder comprising at least one sensor coil and a power coil, so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;
receiving the RF driving field using the power coil so as to derive electrical energy therefrom;
generating an output signal at the wireless transponder indicative of the current flowing in the sensor coil, using the electrical energy derived from the RF driving field by the power coil;
transmitting the output signal from the wireless transponder using the power coil; and
receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is position and orientation coordinates of the object in the body of the subject.

Claim 28. A method according to claim 27, wherein the electrical current in the at least one sensor coil has frequency components at the different frequencies of the one or more field generators, and wherein generating the output signal comprises generating the output signal responsive to the frequency components of the current.

Claim 29.	A method according to claim 27, wherein positioning the one or more field generators and the RF driver comprises synchronizing respective field frequencies of the one or more field generators with a driving frequency of the RF driver.
Claim 30.	A method according to claim 27, wherein generating the output signal comprises producing the output signal so as to indicate a phase of the current flowing in the at least one sensor coil, relative to a phase of the electromagnetic fields.
Claim 31.	A method according to claim 27, wherein generating the output signal comprises generating the signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil.
Claim 32.	A method according to claim 27, and comprising inserting the transponder, together with the object, into a body of a subject, wherein positioning the plurality of the field generators and the RF driver comprises placing the one or more field generators and the RF driver outside the body.
Claim 33.	A method according to claim 32, wherein the object comprises an elongate probe, for insertion into the body, and wherein fixing the transponder to the object comprises fixing the transponder in the probe, and wherein receiving and processing the output signal comprises determining the coordinates of a distal end of the probe in the body.
Claim 34.	A method according to claim 32, wherein the object comprises an implant, and wherein fixing the

transponder to the object comprises fixing the transponder to the implant, and wherein receiving and processing the output signal comprises determining the coordinates of the implant within the body.

Claim 35. A method according to claim 32, wherein the implant comprise a hip joint implant, comprising a femur head and an acetabulum, and wherein fixing the transponder comprises fixing a plurality of transponders respectively to the femur head and the acetabulum, and wherein determining the coordinates of the implant comprises determining a distance between the femur head and the acetabulum responsive to the output signal from the transponders.

Claim 36. A method according to claim 35, wherein determining the distance comprises finding the distance using the transponders during both intraoperative and post-operative periods.

Claim 37. A method according to claim 27, wherein generating the output signal comprises operating the transponder powered solely by the electrical energy derived from the RF driving field by the power coil.

Claim 38. A method for tracking an object in a body of a subject, comprising:

positioning a radio frequency (RF) driver to radiate a RF driving field toward the object at a driving frequency;

positioning one or more field generators so as to generate electromagnetic fields in a vicinity of the

object at respective field frequencies, in synchronization with the driving frequency;
adapting to be fixed to the object, a wireless transponder comprising at least one sensor coil and a power coil, so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;
receiving the RF driving field using the power coil so as to derive electrical energy therefrom;
generating an output signal at the wireless transponder indicative of the current flowing in the sensor coil, using the electrical energy derived from the RF driving field by the power coil;
transmitting the output signal from the wireless transponder using the power coil; and
receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is position and orientation coordinates of the object in the body of the subject.

Claim 39. A method according to claim 38, wherein generating the output signal comprises receiving a frequency synchronization signal from the power coil, responsive to the RF driving field, and applying the frequency synchronization signal in generating the output signal.

Claim 40. A method according to claim 38, wherein the driving frequency of the RF driving field is an integer multiple of the field frequencies of the electromagnetic fields of the one or more field

generators.

Claim 41. A method according to claim 38, wherein generating the output signal comprises producing the output signal responsive to the synchronization of the field frequencies with the driving frequency, so as to indicate a phase of the current flowing in the at least one sensor coil, relative to a phase of the electromagnetic fields.

Claim 42. A method according to claim 38, wherein generating the output signal comprises generating the signal with an output frequency that varies responsive to an amplitude of the electrical current flowing in the at least one sensor coil.

Claim 43. A method according to claim 38, and comprising inserting the transponder, together with the object, into a body of a subject, wherein positioning the RF driver and the one or more field generators comprises placing the RF driver and the one or more field generators outside the body.

Claim 44. A method for tracking an object in a body of a subject, comprising:

positioning a radio frequency (RF) driver to radiate a RF driving field toward the object;

positioning one or more field generators so as to generate electromagnetic fields in a vicinity of the object;

adapting to be fixed to the object, a wireless transponder comprising at least one sensor coil and a power coil, so that an electrical current flows in

the at least one sensor coil responsive to the electromagnetic fields;
receiving the RF driving field using the power coil so as to derive electrical energy therefrom;
generating an output signal at the wireless transponder indicative of an amplitude of the current flowing in the at least one sensor coil and of a phase of the current relative to a phase of the electromagnetic fields, using the electrical energy derived from the RF driving field by the power coil;
transmitting the output signal from the wireless transponder using the power coil; and
receiving the output signal, and processing the amplitude and phase of the current indicated by the output signal to determine three dimensions of position information and at least two dimensions of orientation information wherein the information is position and orientation of the object in the body of the subject.

Claim 45. A method according to claim 44, wherein the at least one sensor coil comprises a single sensor coil, and wherein processing the amplitude and the phase comprises determining a direction of the orientation of the transponder responsive to the indicated phase of the current.

Claim 46. A method according to claim 44, wherein generating the output signal comprises generating the signal with an output frequency that varies responsive to the electrical current flowing in the at least one sensor coil.

Claim 47. A method according to claim 44, and comprising inserting the transponder, together with the object, into a body of a subject, wherein positioning the RF driver and the one or more field generators comprises placing the RF driver and the one or more field generators outside the body.

Claim 48. A method for tracking an object in a body of a subject, comprising:

positioning a radio frequency (RF) driver to radiate a RF driving field toward the object;

positioning one or more field generators so as to generate electromagnetic fields in a vicinity of the object;

adapting to be fixed to the object, a wireless transponder comprising at least one sensor coil and a power coil, so that an electrical current flows in the at least one sensor coil responsive to the electromagnetic fields;

receiving the RF driving field using the power coil so as to derive electrical energy therefrom;

generating an output signal at the wireless transponder having an output frequency that varies responsive to an amplitude of the current flowing in the at least one sensor coil, using the electrical energy derived from the RF driving field by the power coil;

transmitting the output signal from the wireless transponder using the power coil; and

receiving and processing the output signal to determine three dimensions of position information and at least two dimensions of orientation

information wherein the information is position and orientation coordinates of the object in the body of the subject, responsive to the output frequency.

Claim 49. A method according to claim 48, and comprising inserting the transponder, together with the object, into a body of a subject, wherein positioning the RF driver and the one or more field generators comprises placing the RF driver and the one or more field generators outside the body.

ix. **Evidence Appendix**

Not Applicable.

x. Related Proceedings Appendix

Not Applicable.